

Navy ILE Introduction



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2 March 2006

List of Effective Pages

Section	Page(s)	Affected paragraph(s)

Change Record

Paragraph	Description of Change	Date	Authorized By

Acronyms, Abbreviations, Definitions

5VM	5 Vector Model
ADL	Advanced Distributed Learning
CMI	Computer Managed Instruction
CORDRA	Content Object Repository Discovery and Registration/Resolution Architecture
DoD	Department of Defense
ELO	Enabling Learning Object
EXCEL	Excellence through a Commitment to Education and Learning
XML	Extensible Markup Language
HPSM	Human Performance System Model
ILE-ISA	Integrated Learning Environment – Information Services Architecture
ILE	Integrated Learning Environment
KSATT	Knowledge, Skills, Abilities, Tasks and Tools
LOM	Learning Object Metadata
LOS	Learning Objective Statement
NCOM	Navy Content Object Model
R3	Reuse, Repurpose, and Reference
RiT	Revolution in Training
SCORM/IMS	Sharable Content Object Reference Model/Integrated Management System
SCO	Sharable Content Object
SCORM	Sharable Content Object Reference Model
TFE	Task Force EXCEL
TLO	Terminal Learning Object

See the ILE website for a complete list of acronyms, abbreviations and definitions.

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1. Executive Summary

When the Navy is not fighting, it is training. When the Navy is fighting, it is training. The most important ingredient in the Navy's success is the talent, energy, dedication, skill, and courage of Sailors. Their growth and development must be the highest priority for Navy leaders. – Revolution in Training

The United States Navy is engaged in an enterprise-wide transformation of how it operates in an effort to improve and align its organizations, incorporate new technologies into Navy training, exploit opportunities available from the private sector, and develop a continuum of lifelong learning and personal and professional development for Sailors. A key enabler at the foundation of this transformation is the Navy's Integrated Learning Environment (ILE).

The ILE is the means to deliver individually tailored, high quality learning to all who serve maximizing career development and job performance. – Revolution in Training

This report outlines the ILE transformation strategy and architecture that enables the program management and the functional and technical integration of processes, products, and people involved in capturing, organizing, designing, validating, and deploying instructional and technical content to the users in the right format and place at the time of need.

The ILE is the Navy's new generation of training systems and methods designed to implement the vision and objectives of the Revolution in Training. These include tailoring training and learning events to each of the 370,000 Sailors and their individual needs, focusing training and learning on job-oriented skill and knowledge gaps, and using reusable object-based content structured according to the Sharable Content Object Reference Model (SCORM) standard. The ILE provides a complete environment of technology tools, information architecture, and data formatting and exchange standards.

Note

This document is an example of Reuse, Repurpose, and Reference (R3) in that it has repurposed Shareable Content Object Reference Model (SCORM 2004) sequencing content from the Learning Systems Architecture Lab at Carnegie Mellon University. Their work, except where otherwise noted, is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike License.

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2. Overview

The following sections briefly describe the vision, mission, and goals of the Navy Integrated Learning Environment (ILE) and the role that the Navy Content Object Model (NCOM) has within the Navy ILE. Additionally, the concepts of interoperability, and Reuse, Repurpose, and Reference (R3) are introduced. Finally, the relationship between Navy-SCORM and the Advance Distributed Learning (ADL) Shareable Content Object Reference Model (SCORM 2004) is discussed.

3. Purpose Statement

This document serves as the first step in understanding Navy-SCORM (NCOM) for the development of Navy Integrated Learning Environment (ILE) content. The initial rules and guidelines listed in this document represent a starting point in the process of the NCOM development. The document will be used to develop Navy ILE content that adheres to both the Navy ILE vision and mission and NCOM.

4. Task Force EXCEL

Task Force Excellence through a Commitment to Education and Learning (EXCEL) (TFE) is creating major cultural changes by focusing Navy learning on fleet mission requirements through the use of human performance measures – providing Sailors with the “tools and opportunities” to grow and develop, both professionally and personally, while improving mission accomplishments.

The Four Quadrant Human Performance System Model (HPSM) is the underlying human performance process by which TFE and partners are redefining Navy policies, structures, and mechanisms.

The 5 Vector Model (5VM) defines the parameters around which a Sailor’s personal and professional development is designed. The five vectors are:

- Professional Development
- Personal Development
- Leadership
- Certifications & Qualifications
- Performance

5. SeaWarrior

Sea Power 21 is an initiative that provides the strategic vision for how the Navy organizes, integrates, and transforms to deal with the dynamic threats we face in today’s global environment. It reflects fundamental changes in the technology and tactics used to strike our enemies, in how we defend the fleet and the nation through control of the seas, and in the approach to how we deploy resources to support both our offensive and defensive capabilities. Sea Power 21 consists of three key components:

- Sea Strike – Projecting Precise and Persistent Offensive Power
- Sea Shield – Extending Global Defensive Assurance

- Sea Basing – Enhancing Joint Operational Independence

Sea Strike, Sea Shield, and Sea Basing are enabled by ForceNet, an overarching effort to integrate warriors, sensors, networks, command and control, platforms, and weapons into an integrated and networked combat force from the seabed to space. ForceNet is the Navy's plan to make network-centric warfare an operational reality. Essentially, it entails using information technology (particularly networked sensors and command and control systems) to improve real-time situational awareness, and enable warriors at all levels of the chain of command to make more informed decisions and therefore improve combat operations and increase force survivability.

Underlying Sea Power 21 is a Global Concept of Operations that governs how to manage and deploy unprecedented combat power and war fighting capabilities. It determines the size and composition of the Fleet, based on the war fighting strategy. This Global Concept of Operations is supported by a triad of organizational processes:

- Sea Warrior – Putting the right Sailor with the right skills in the right job at the right time.
- Sea Trial – Enabling innovation through rapid concept and technology development.
- Sea Enterprise – Streamlining operations and retiring obsolete systems/platforms to free up resources for investment in the new infrastructure needed to transform the Navy.

This triad enables the Navy to perform some of its most basic mission-essential functions. Sea Warrior encompasses the full human resources lifecycle – from recruiting, to training and education, to staffing and career management, to how we leverage the investment made in Sailors after they retire. Taken together, Sea Trial and Sea Enterprise address the full lifecycle of technology resources – from requirements gathering, to innovation and research and analysis, to prototype development, to acquisition, to how and when to remove obsolete or redundant systems and platforms.

According to Admirals Harms, Hoewing, and Totushek:

This is the goal of Sea Warrior: to integrate the Navy's manpower, personnel, and training organizations – active and reserve – into a single, efficient, information-rich human resource management system. Its focus is on growing individuals from the moment they walk into a recruiting office through their assignments as Master Chiefs or Flag Officers, using a career continuum of training and education that gives them the tools they need to operate in an increasingly demanding and dynamic environment. Through Sea Warrior, we will identify Sailors' precise capabilities and match them to well-articulated job requirements that far exceed the simplistic criteria used today. In addition, we will implement different types of incentives and flexible rotation dates and move the Navy toward a job-based compensation system.

- U.S. Naval Institute Proceedings from June 2003

This solution provides the Sailor with access to a career-long training and education continuum and allows learners instant access to the tools to perform their jobs successfully.

6. SkillObjects

In 2002, the Chief of Naval Operations (CNO) funded the Navy's Workforce (INWF) project, an aggressive effort to develop a data rich, occupational analysis that would update the Navy Occupational Standards. The SkillsNET Corporation process, suite of technology, and information rich data model was selected by Navy Leadership to underpin the occupational analysis effort. SkillsNET's data model, the trademarked SkillObject™, brings a fidelity and structure to an otherwise incomplete and unstructured human resource data modeling.

The initial requirement was to capture and characterize the occupational work (jobs) for Navy enlisted personnel. Based on this information, a new occupational classification system that integrates data clusters of knowledge, skills, abilities, tasks and tools (KSATT) which are components of a SkillObject was established. SkillObjects are used to develop a set of normative data ready for multiple uses in all types of other applications and other processes. The organizational structure of occupational data affords Naval Leadership a strategic view of work and adds a new dimension of currency to work descriptors.

Subsequent CNO funding supported the effort to classify SkillObjects into skill standards that are used for numerous Navy functions, including manpower, recruiting, distribution, and training. CNO initiated the Sea Warrior Project that builds from the work-based standards to capture and provide Sailors with an environment whereby they can make decisions about career choices, follow-on duty assignments, and training.

The Level I Job Task Analysis generates two kinds of SkillObjects which relate to work being accomplished. These are Occupational and Organizational SkillObjects. Occupational SkillObjects are defined as work accomplished that is primary to a Navy occupation. The training for this work is usually accomplished through formal training as in schools or center classes.

Organizational SkillObjects are defined as work accomplished through "other duties as assigned" or collateral duties, work that is not considered an official Navy occupation; these include watches.

The Level II Training and Requirements Analysis provides information for training and the Integrated Learning Environment (ILE). The content data elements offer more granular/discrete descriptors of work requirements and performance statements. Level II data elements are anchored by subtasks, steps, specialty skills, special abilities, specific tools, specific knowledge, specific resources, and performance standards.

7. Integrated learning Environment

In December of 2002, NETC established the ILE as a mechanism for transforming legacy systems and business processes into a "system of systems" that would enable the changes needed to accomplish Revolution in Training (RiT) goals and provide the functions required to realize Sea Warrior. The stated ILE vision is, "Improve and support job performance and mission readiness by providing high quality learning and performance support available anytime and anywhere. Provide an environment to analyze, define, develop, document, and implement human performance and learning

alternatives, acquire products, and provide lifecycle support per the vision, goals, and objectives of the RiT.”

There is a range of key functional participants that operate in the Navy's ILE:

- Navy Learners – People and organizations receiving learning to improve readiness and performance.
- Navy “Users” – People and organizations responsible for providing learning (e.g., educators, trainers, managers, personnel, and operators) and receiving learning to improve readiness and performance.
- Acquisition Interests – Those responsible for learning acquisition considerations, including government and private-sector interests having both managerial and technical responsibilities.
- Content and Tool Providers – Government and private sector interests responsible for designing and developing learning content and tools (e.g., SCORM conformant content, Learning Management Systems, Learning Content Management Systems, information technology architectures, etc.).

The ILE, therefore, must have well-defined interfaces that allow people to interact, organizationally and technically, within the Navy, as well as with other audiences in the Department of Defense (DoD), federal government, and the private sector. This will be especially important as technology-enabled, sharable, reusable content and tools become more ubiquitous, and as technology-enabled interactions between the learning, personnel, and operational communities become more commonplace.

The ILE is people, processes, and technologies. While the most obvious attributes are technologies, the ILE was conceived as a means to enable individual excellence through highly personalized interfaces with essential decision support and learning activities with supporting business rules. The ILE combines support tools for developing and distributing electronic course materials, and managing student and curriculum records, with standards for classifying content, formatting files, and providing interoperability among other systems. It provides five primary services to its users:

- Design, develop, and display of individual learning plans derived from Sea Warrior validated organizational requirements.
- Content design, development, display, and event data capture for learning and performance support.
- Learning consumption, ashore and afloat.
- Performance assessments.
- Business analytics for managing investments.

The ILE supports a range of pedagogical and adult learning approaches to meet the diverse requirements of the Navy's workforce. Therefore, the Navy's primary investment will be learner-centric, highly deployable content.

8. ILE Architecture

The Integrated Learning Environment – Information Services Architecture is the technological and procedural foundation of the RiT, which enables the CNO's vision to become reality. ILE-ISA will comply with the Sea Warrior Enterprise Architecture

conforming to DoD guidance and industry best practices that addresses technology, business processes, and organizational roles and responsibilities as one unified comprehensive architecture. As a key component of the Sea Warrior Enterprise Architecture, it encompasses the full set of integrated functions and specifications from networks, computing hardware, software applications, database design, standards-based interoperability methods and protocols, user-based use cases, and advanced information specifications. ILE-ISA provides the primary operational capabilities required for the RiT that can be enabled or supported by technology.

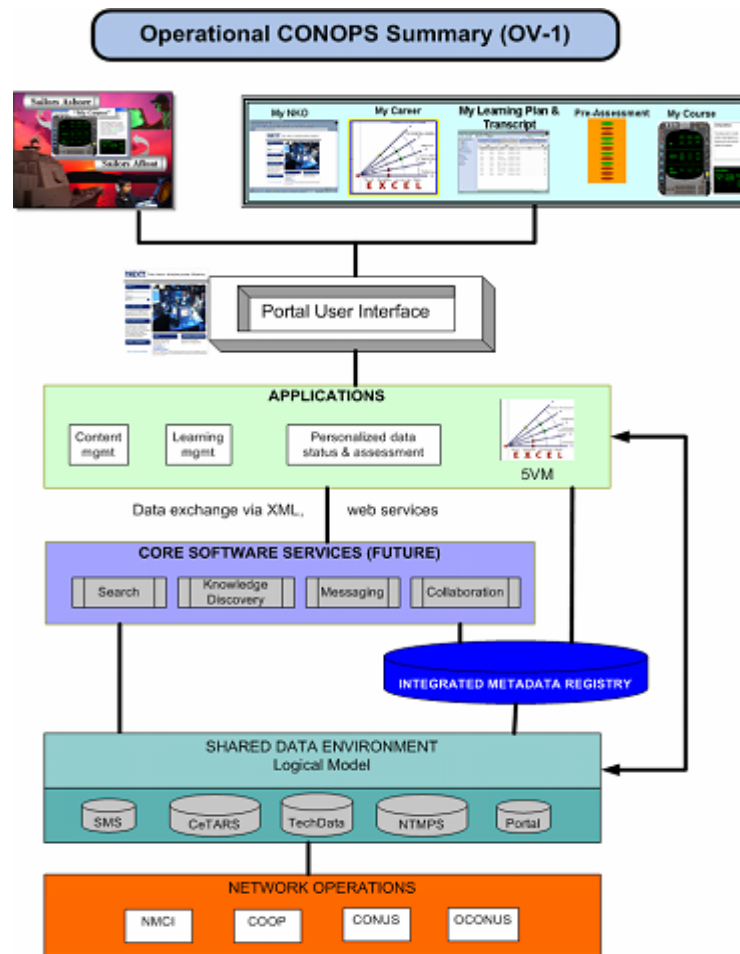


Figure 1 ILE-ISA layered architecture of the Navy training and education planned information infrastructure

8.1. My Course

My Course is defined as the collection of learning content that is personalized for an individual Sailor and delivered within the context of My Learning Event. Training needs are based on a gap analysis using the Job Task Analysis data. The gap analysis identifies all of the SkillObjects needed to satisfy a training requirement.

8.2. ILE Process

The overall objective of content development for the ILE is to conduct a systematic planning process prior to the development of courseware. Instructional design involves the consideration of many factors during the ILE content development process. At its most basic level, the instructional designer:

- Identifies the goals of the instruction.
- Determines the instructional strategy and the medium.
- Determines how the course and instructional materials are evaluated.

Refer to the Navy Instructional Systems Design and Instructional Design Process document.

9. Navy-SCORM

NCOM abides by specific Extensible Markup Language (XML) and data design rules. Technically, it is a data drill-down that gives meaning to the Assets, Enabling Learning Objects (ELOs), Terminal Learning Objects (TLOs) within the NCOM hierarchy. The data drill down hierarchy of the NCOM dictates that:

- Learning Object Aggregation is the top-level grouping of related content containing TLOs and ELOs.
- A TLO is an aggregation of one or more ELOs
- An ELO is an aggregation of one or more Assets
- An Asset is a single media element or a single text element

The NCOM organizational structure is devised according to the requirements of XML and data systems logic. This logic is captured in the NCOM XML model and allows for the storage and retrieval of content data by Content Management Systems (CMS) and Learning Management Systems (LMS). The integrity of the NCOM content XML structures must be strictly maintained in order for the ILE to function.

The TLO is coded as an XML “container” element, as is an ELO. Container elements are formal, hierarchical designations devised for the sake of sound XML data design. The TLO and ELO elements hold no raw data. Only the Asset element holds raw data. Just as relational databases must follow strict rules of data design, so must the NCOM.

A Sharable Content Object (SCO) is a launchable object that includes the Computer Managed Instruction (CMI) tracking for launch and completion. An ELO is represented by a SCO.

The SCO is the basic building block for SCORM-conformant courseware. A SCO is a collection of assets developed to provide the instructional requirements of an Enabling Learning Objective.

NCOM builds on established Sharable Content Object Reference Model (SCORM) principles and facilitates the implementation of SCORM. NCOM is a SCORM-based standard that facilitates content organization and SCORM supported behaviors through

advanced aggregations of content. By default, learning content delivered according to the NCOM standard is SCORM conformant.

Content that has earned designation as "SCORM-conformant" has been designed, developed, and validated according to the rules and regulations specific to ADL SCORM.

Visit www.adlnet.org for SCORM documentation.

9.1. Reuse, Repurpose, Reference

The development of the NCOM was fueled by the need to efficiently and effectively R3 objects in order to create content for the Navy ILE. The following defines R3:

- Reuse – The use of an existing object in a new learning event without any modification to its instructional treatment, context, or content.
- Repurpose – The use of an existing object in a new learning event with little to no modification to its instructional treatment, context, or content.
- Reference – The use of an existing object as an information source or resource for generating ideas for new learning events.

Specifically, Navy-SCORM was devised to provide a data structure that fulfills the following requirements:

- Interoperability to facilitate the R3 of content items across multiple communities
- Creative, sound, and effective Instructional Systems Design.
- Application of various learning theories to facilitate performance-based learning and measurable outcomes.

Navy-SCORM fulfills these requirements by abiding by specific XML and data design rules.

9.2. DoD and the ADL SCORM

The SCORM is part of a strategy called the ADL initiative. The primary sponsors of the ADL initiative are the United States Department of Labor, DoD, and the National Guard Bureau. The White House Office of Science and Technology Policy established the ADL initiative in 1997 to standardize and modernize the way in which training and education are delivered. The ADL initiative and SCORM seek to maximize technology-based learning to generate substantial cost savings. Government, academia, and private industry from around the world support ADL and SCORM initiatives. SCORM promotes efforts in four areas: reusability, durability, accessibility, and interoperability (see Table 1).

Table 1 SCORM Concepts and Definitions

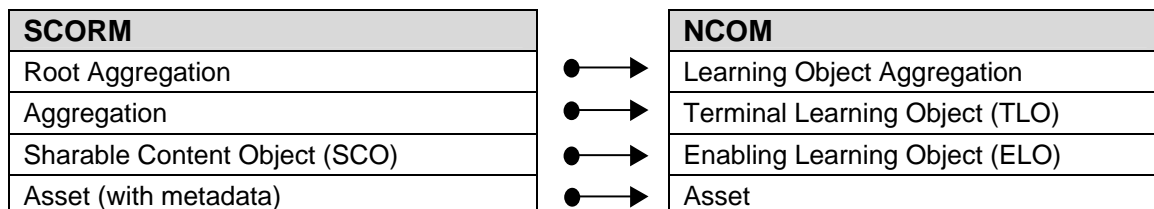
SCORM Concept	Definition	Example
Reusable	Content is reused in a new context without any modification to its instructional treatment, context, or content, and is able to “stand alone.” It can be used across communities for many different learners.	Content about the hydraulic mechanisms of a turbine engine can be used across communities of practice within the Navy as well as other DoD entities.
Interoperable	Content will function in multiple applications, environments, and hardware and software configurations regardless of the tools used to create it and the platform on which it is delivered.	Content developed in a development software tool for delivery in a LMS will operate in any other SCORM-conformant LMS equally well.
Durable	Content does not require modification to operate as software systems and platforms are changed or upgraded.	Purchasing a new revision of a development software tool or upgrading the existing development tools will have no impact on the delivery of content to the learner.
Accessible	Content can be identified and located when it is needed and as it is needed to meet training and education requirements.	An Instructional Designer can search a repository for content on turbine engines and identify the existing content available for the course, based on descriptive information about the content supplied by the original developer or content owner.

9.3. Navy-SCORM Metadata

The purpose of metadata is to provide a common nomenclature enabling learning resources to be described in a common way. Metadata can be collected in catalogs, as well as directly packaged with the learning resource it describes. Learning resources that are described with metadata can be systematically searched for and retrieved. (ADL, 2004, p. CAM-4-4)

In order to catalog and search for objects (i.e., Assets, ELOs, and TLOs) within the repository, SCORM Learning Object Metadata (LOM) XML metadata must be applied to these objects. Navy-SCORM uses the SCORM/IMS Packaging and the IEEE 1484.12.1 LOM specification as its content and configuration model.

Figure 2 shows the relationship between SCORM and the NCOM hierarchy.

**Figure 2 SCORM and NCOM hierarchies**

SCORM/IMS Packaging and its LOM are a specific form of metadata. Within the SCORM/IMS Packaging model there are essentially two types of metadata documents:

- Manifest document – supplies the content references and organization of a collection of content objects.
- LOM – supplies descriptive information concerning the nature and contents (assets) of specific learning objects.

The SCORM notion of a learning object embraces individual media files as well as collections of content into hierarchical structures.

For more information, reference the SCORM/IMS Packaging specification.

9.4. Repository

A content repository is a data storage facility for content and content metadata. The Navy's ILE NCOM is designed to harness the repository and R3 concepts and allows for the following:

- Reuse of objects contained within the repository.
- Repurpose of objects contained within the repository (this can also include the use of raw data).
- Reference to objects contained within the repository.
- Development of new objects created from raw data.
- Reliable presentational rendering of content by a conformant LMS or LCMS according to the intentions of content designers and developers.

The DoD Instruction 1322.20 provides much additional detail and requirements for repositories and registration and should be referred to for all such matters.

Similarly the evolving work from the Content Object Repository Discovery and Registration/Resolution Architecture (CORDRA) will contribute much more in the future to these issues. CORDRA aims to identify and specify (not develop) appropriate technologies and existing interoperability standards that can be combined into a reference model that will enable learning content to be found, retrieved and reused.

See <http://cordra.lsal.cmu.edu> and the ADL web site at <http://www.adlnet.org> for more details.

10. Navy Objective Statements

Learning objectives serve as the link to SkillObjects™ and related work elements, Enterprise Competencies (competencies that show the linkage between DoD and Navy mission-essential competencies), and content. As the Navy moves forward with its commitment to the ILE as the learning platform for SeaWarrior, there is an identified need to develop a common language or data model to capture, store, share, and reuse learning objectives which may then be assembled into learning objective statements (LOS) to support content-specific learning objects. LOSs will be formulated using SkillObjects as the foundation for defining job/position requirements for position skills,

unique knowledge, tools, resources, and abilities to represent the full spectrum of work proficiency required.

For more information on composing learning objectives, review the [Learning Objective Statement Guidance](#) document.

10.1. Terminal Objectives

A terminal objective is a major objective for a topic or task. It describes the overall learning outcome.

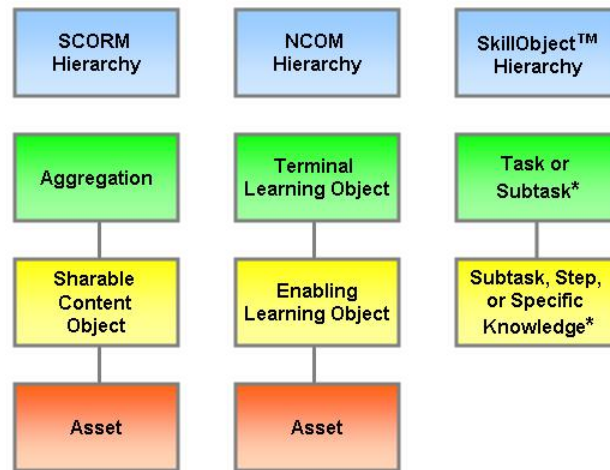
10.2. Enabling Objectives

An enabling objective supports a terminal objective. It is written at a lower level (category) of knowledge than the terminal. It generally describes specific behaviors (single activities) that must be learned or performed.

11. The Navy Content Object Model Defined

Technically, the NCOM is a data drill-down that gives meaning to the Learning Object Aggregation (LOA), Terminal Learning Object (TLO), Enabling Learning Object (ELO), and the Asset that make up the NCOM hierarchy. The NCOM seamlessly correlates to the SCORM. The NCOM's hierarchical objects are defined in the table.

Object	Description
Learning Object Aggregation	The LOA is the top level grouping of related content; the LOA is also called the organization that contains TLOs and ELOs.
Terminal Learning Object	The TLO is an aggregation of one or more ELOs. It satisfies one terminal objective and correlates to a SCORM aggregation.
Enabling Learning Object	The ELO is an aggregation of one or more Assets, it satisfies one enabling objective and correlates to a SCORM SCO.
Asset	An asset is the base building block of ELOs, it is either a representation of text or a media element (e.g., web file, assessment object, video, and other data elements).



* The mapping of SkillObject data to terminal learning objects and corresponding enabling learning objects will depend on the training requirements. Other job task analysis sources may be used, if needed, to augment the SkillObject data. However, if using another source, it must align to authoritative SkillObject data.

Note: It is recommended that a terminal learning object represent about an hour of instruction and the corresponding enabling learning objects about 15 to 20 minutes of instruction. This structure facilitates the reuse of content.

Figure 3 SCORM Hierarchy Compared to the NCOM Hierarchy and Job Task Analysis Data

12. Summary

The Integrated Learning Environment (ILE) was established by NETC to support the changes needed to accomplish the RiT goals and provide the necessary functions to accomplish SeaWarrior.

The Navy ILE revolutionizes how the Navy provides education, training and performance support. It is the flagship of the learning technology fleet.

It is also an integrating mechanism that makes it possible to move tailored learning across the personnel and learning domains – anytime and anywhere – in order to improve individual and mission readiness and performance. In that regard, it is a critical enabler for several of the Navy's priority transformation initiatives, like Sea Warrior and Sea Power 21.